METHOD OF PROGRAMMING AN ANTIFUSE

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ABSTRACT

An antifuse, which has a programmable material disposed between two conductive elements, is programmed using multiple current pulses of opposite polarity. The first pulse has a current that is insufficient to fully program the antifuse, i.e., produce a desired level of resistance. In one embodiment the first pulse is current limited. The first pulse advantageously drives a conductive filament from one conductive element through the antifuse material, which may be, e.g., amorphous silicon. The conductive filament from the first pulse, however, has a limited cross sectional area. A programming pulse having the same voltage with opposite polarity and a current with increased magnitude is used to drive material from the other conductive element into the antifuse material, which increases the cross sectional area of the conductive filament thereby reducing resistance. Additional programming pulses, as well as current limited pulses, may be used if desired. Programming an antifuse in accordance with the present invention results in an antifuse structure with a conductive filament that is in good contact with both conductive elements, which reduces resistance in the antifuse and increases yield. A programming circuitry is provided that includes a current source and a voltage clamp to program antifuses according the described method.